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ABSTRACT

This paper describes a 3-week summer science academy that helped student teachers experience hands-on, inquiry-based science in a realistic educational setting and promoted reflection. The academy involved master teachers, who oversaw and mentored groups of student teachers, who in turn facilitated integrated, science-based learning experiences with school children. In week 1, master teachers worked with student teachers to develop teaching skills and an understanding of the academy curriculum. During weeks 2 and 3, student teachers taught elementary and middle school students, implementing the academy curriculum they learned during the first week. The remaining time was spent on reflection and preparation.Cohorts met for working lunches, during which mentor teachers modeled the reflection process. Academy staff met after lunch to discuss common issues. A multi-level reflection model was developed using several approaches to elicit reflective thinking from student teachers (reflecting in writing on one's own teaching, cohort-level reflection sessions, and faculty reflection sessions). Data from student teachers' written reflections highlighted several themes: reflection as a self-evaluative/personal growth tool; reflection as part of the academy's community of learners, and reflection as an essential piece of the teaching process. (Contains 13 references.) (SM)

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Summer Experiences Promote Reflective Practice

In Preservice Teachers:

The Oklahoma State University

Science Summer Academy, One Successful Design

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An initial review of the construct, reflection, is necessary to thoroughly examine the topic for this paper, reflective practice. From the 1933 view of Dewey to the contemporary beliefs of Merriam and Caffarella, the notion of reflection has changed little throughout the 20th century. Reflection is "...an active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds supporting it and future conclusions to which it tends" (Dewey, 1933, p. 9). "Reflective practice allows one to make judgements in complex and murky situations—judgements based on experience and prior knowledge" (Merriam & Caffarella, 1999, p. 232).

The beginnings of reflection as a process are historically based in experiential learning theory in which experience is an important part of the learning process (Osterman, 1991). Reflection is used as a learning tool by many professionals and is widely defined and discussed by learning theorists. Dewey, as well as various contemporary learning theorists such as Kolb and Schön, place emphasis on reflection for its role in the learning process (Osterman 1991; Rigano & Edwards, 1998). Rigano and Edwards (1998) contend that a dominant feature in most adult learning theories is the importance placed on the reflective process as it is used to integrate new experience with past experience.

Reflective practice as used in an educational setting is one form of reflection. Drawing a definitive line between reflective practice and other forms of reflection is a complex task. The examination of action technologies, a product of the business world, is essential to establishing a context for this distinction. Central to all action technologies is the notion that learning takes place through experience in cycles of action and reflection. Watkins and Brooks (1994) describe five action technologies that all look toward an end result of change, empowerment, or increased knowledge. All follow similar processes, but vary in the composition of those involved in the reflection (group vs. individual) and the target of the change process (organization, group, individual). The focus of action technologies falls on a continuum between action and reflection and can be either facilitator led or participant/self-led (see Figure 1).

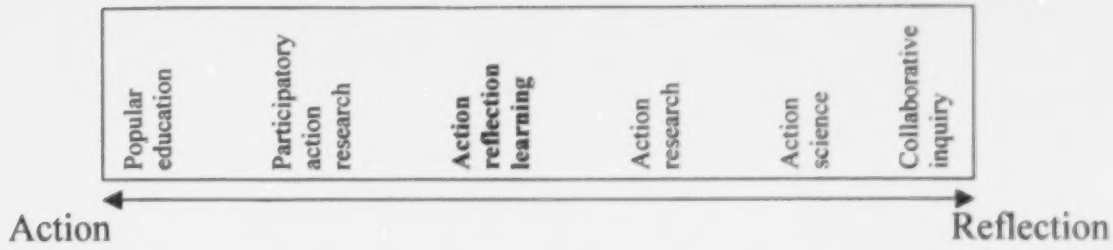

Figure 1. Continuum of Action Technologies based on Focus (Watkins & Brooks, 1994).

Of particular interest in the discussion of reflective practice is the action technology, action reflection learning. Action reflection learning, also called action learning, is typically a group process where individuals from varying backgrounds come together to examine assumptions while engaging in problem-setting and problem-solving. O'Neill (1994) describes action reflection learning as a method of critical reflection. In professional writings, critical reflection is more commonly referred to as critical thinking or reflective practice (Merriam & Caffarella, 1999). The term "reflective practice" was popularized by Schön (Osterman, 1991) and is most often referred to in the realm of education. Reflective practice is used in professions such as teaching where the integration of field experience and academic study is essential (Boud & Walker, 1998). "Reflective practice...engages the teacher in a cycle of thought and action based on professional experience" (Wellington, 1991. p. 4).

Perhaps the most influential theory in regard to reflective practice is that of Donald Schön. Schön's model is considered to be one of professional problem solving. Central to reflective practice are Schön's notions of reflection-in-action, reflection-on action, and reflection-for-action (Yost, Forlenza-Bailey & Sentner, 2000; Merriam & Caffarella, 1999; Geddis, Lynch & Speir, 1998; Ferry & Ross-Gordon, 1998; Rigano & Edwards, 1998). Reflection-in-action is a spontaneous reflection in the midst of action. Reflection-on-action is a "reconstructive mental review" of one's actions and thoughts after an action is completed (Ferry & Ross-Gordon, 1998. p. 106). "Reflection-for-action is the desired outcome for the first two types of reflection" (Yost et al., 2000. p. 40).

A more practical definition of reflective practice can be framed in terms of educator characteristics. In the Ferry and Ross-Gordon study of extension educators (1998), those considered to be reflective had to demonstrate four out of these six indicators which are based on

Schön's reflection-in-action process: "a) recognition of the problem; b) recognition of incongruities; c) evidence of reframing of the problem; d) generation of new solutions; e) testing in action of solutions; and f) evaluation of outcomes" (p.102).

Reflective practice as a process can also be illustrated with concrete behaviors. Yost et al. (2000) describe Van Manen's three-stage model that demonstrates the progression of the development of reflection. In the first stage reflection is "confined to analyzing the effects of strategies used" (p. 40). Stage two involves the analysis of the theory that underlies classroom practice and the effects on student learning. Moral and ethical dimensions related to classrooms are questioned in the third stage of reflection (see Figure 2).

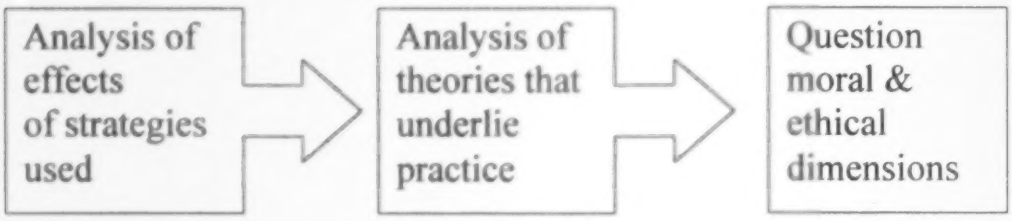
Analysis of effects of strategies used
Analysis of theories that underlie practice
Question moral & ethical dimensions

Figure 2. Van Manen's Stage Theory of Reflection (Yost et al., 2000).

With all these views there is no consensus about the end result of reflective practice/critical reflection. Osterman (1999) proposes that "reflective practice is a professional development process whose primary objective is behavioral change not the acquisition of information or knowledge" (p. 210). On the other hand, Yost et al. (2000), contend that "the end result of critical reflection for the individual is cognitive change" (p. 41). Finally, O'Neill (1994) would argue that critical reflection could transform thinking because it is directed at the basic understanding of the experiences.

In spite of this disagreement, all researchers concur that reflection provides professional development by allowing the clarification of thought and the challenging of beliefs (Ferry and Ross-Gordon, 1998; Rigano & Edwards, 1998; Swain, 1998). The Oklahoma State University (OSU) Science Summer Academy has at the heart of its design this very notion.

The three-week Academy design allows students of all levels to experience hands-on, inquiry-based science in a realistic educational setting. The academy has several layers of participants beginning with the Master Teacher (MT) who will oversee and mentor a group of

Potential Teachers (PTs) who will in turn facilitate integrated, science-based learning experiences with a group of students.

The first week of the academy involved four Master Teachers working with 20 Potential Teachers to help them develop teaching skills and an understanding of the Academy curriculum. During this week, each Master Teacher was assigned a group of 5 PTs (a Cohort) to mentor throughout the Academy. With Potential Teachers taking on dual roles as teachers and students, Master Teachers went through each activity of the curriculum sequentially. Review of the curriculum is a vital component to the first week in that it allows the PTs to build a strong understanding of the Summer Academy curriculum. As MTs model the teacher's role as facilitator, special attention was given to making Potential Teachers aware of the issues that are associated with each activity such as classroom management, materials management, time management, integration, questioning, developmental readiness of various age groups, the learning cycle, and content. In addition, the Master Teachers model and share their reflective thinking as they progress through teaching the curriculum.

During this first week, building bonds between the Summer Academy staff members is essential. A cohesive group ensures a supportive teaching environment where feedback is seen as constructive rather than critical. During weeks two and three of the Academy, the aspiring educators taught approximately 200 elementary and middle school students. Each morning Potential Teachers implemented the academy curriculum that was modeled during week one by Master Teachers. The remaining time was spent on reflection and preparation. Teaching as reflective practice requires introspection into one's teaching to grow as a teacher. Reflection is a learned process and should be modeled for future teachers and seen as a practice experienced teachers do on a daily basis. At noon each day of weeks two and three, Cohorts met for a working lunch. During the initial lunch, the Master Teacher modeled the reflection process, which reviewed the morning's activities with an emphasis on questioning skills, content, classroom management, and other pedagogical issues. Potential Teachers actively participated in reflection during the remaining days. Following lunch, the entire Summer Academy staff met to discuss common issues, and ended with a culminating activity.

Yost et al. (2000) believe that reflective practice can be taught and insist that there are two essential elements in the development of reflection skills. 1) There must be supervised practical experiences to provide foundation for the reflection. 2) A meaningful knowledge base

must be connected to experiences. Although studies show that reflection skills can be learned by professionals (Rigano & Edwards, 1998; Swain, 1998; Geddis et al., 1998), Boud and Walker (1998) suggest that there are several caution areas which should be addressed when preparing to teach these skills in a formal adult learning environment (i.e. professional courses). The first suggestion is to avoid reducing reflection to that of recipe following. This can cause reflection to become "ritualized", disregarding the context or outcomes. Reflection for the sake of reflection should be avoided. It is important to provide reflective activities that are in the appropriate learning context. Therefore, matching the type of reflection with the purpose and context of the experience is important. Adult educators should also avoid making the assumption that they can control the topics of student reflection. Reflection can often lead to students revealing information that the teacher is unprepared to address. The fifth area that deserves consideration is to avoid making reflection strictly an intellectual process. Reflection is a learning process and has an emotional component. The OSU Science Summer Academy design incorporates these two elements. The first weeks of preparation are designed to provide foundation for the upcoming teaching experience and following reflection. Additionally, the daily interaction between the members of the Cohort provides an ideal supervisory environment. The Cohort spends at least six hours per day for each of the 15 days teaching, reflecting on, modifying, and preparing lessons. Further, Hatton and Smith (1995) suggest the use of a critical friend as an effective tool for the development of reflection. The Master Teacher plays this critical friend role for each of the Cohort members.

The Master Teacher plays a second role, that of facilitator or leader of Cohort discussion. Through this role, the MT that fosters reflective action by using the following guiding questions. Wellington (1991) as well as Yost et al. (2000) describe a set of questions, devised by Smyth that can be used to guide the reflective process:

1. What do I do? Describe what the actions are in the experience.
2. What does this mean? Inform the practice by incorporating theoretical knowledge, theories in use.
3. How did I come to be this way? An educator should confront what brought him/her to this point in thoughts and actions.
4. How might I do things differently? The experience should be reconstructed to incorporate solutions and modifications.

Another set of questions as delineated by Osterman (1991) can guide reflection from a problem identification and problem solving perspective. "What was the problem? What were my

intentions? What did I do? What happened? Did my actions create the impact that I intended? "(p. 211).

Having used a similar design for the past 3 Summer Academies, each year the design was amended based on program evaluations, comments from both PTs and MTs, and Academy Director observations. Finally, for the 2000 Summer Academy, I wanted to see if all the effort put into designing and redesigning this particular aspect of the Academy was actually promoting reflection in these preservice teachers.

A multi-layered reflection model was used that incorporated several approaches used to elicit reflective thinking from the Potential Teachers. This multi-layered model relied on providing three levels of reflection for the PT. First, each PT was asked to reflect at an individual level on her or his teaching. Through writing prompts, each teacher would think about the day's lesson. The Master Teachers and myself, the Academy Director, were also available to the Potential Teachers to assist them in thinking in a more in-depth way about their teaching. In addition, each PT participated in a cohort level reflection session immediately after the lessons were taught. This took place in a non-threatening casual atmosphere during a working lunch. The MT took on the role of facilitator and used inquiry questioning to prompt discussion of the lessons. Finally, the PTs and MTs, lead by the Academy Director would engage in a faculty level reflection session. This whole group session gave each cohort the opportunity to share something from the cohort level reflection and it also allowed for one particular issue from the day to be discussed in depth. Both the cohort and faculty level group sessions fully demonstrated the social nature of reflection. PTs were encouraged to go to their colleagues at any time to ask questions or discuss issues that were of interest.

The participants in this study were the 19 Potential Teachers of the OSU Science Summer Academy. Among this group of PTs there were 18 females and one male. There was a wide range of experience levels. From those having just completed their Junior year in high school to university seniors.

Each day, the Potential Teachers completed an individual written reflection based on a particular focus question. Each Potential Teacher's reflection pieces were collected and bundled in chronological order. I read these pieces daily and made comments and asked questions about what was written as well as about what was implied.

I read and read again each document looking for themes and patterns. Since the purpose of the study was to get at how the PTs used reflection and how they came to value it, one particular writing prompt was used for the primary source of data, "What impact has reflection had on your teaching and your view of the process of teaching/facilitating inquiry-centered science lessons?". An analysis of the Potential Teacher's daily reflections resulted in the following themes: reflection is a self-evaluative/personal growth tool, reflection is part of the community of learners that existed in the Summer Academy, reflection is an essential piece of the teaching process.

Reflection is a self-evaluative/personal growth tool

While emphasizing the primacy of experience in the learning process, reflective practice promotes critical thinking and collegial interaction. Summer Academy participants, Sue and Joan, suggest an interest in understanding their experiences allowing themselves to strive toward a proactive rather than reactive stance. "I never realized how important reflection was until I started the Academy. I've learned that without reflecting, you can't really understand your mistakes, and you will continue to make them without reflection" (Sue). "When I had problems, I could reflect on what happened so I don't have the problem again" (Joan). In addition, PTs began to set goals for their teaching and critically examined their personal theories of teaching. "Reflection has helped me consider how I want to teach. Each time I reflect on my day, I end up thinking of the day ahead and what I want to accomplish. I often think of questions to ask and new ways to guide students" (Barb). Finally, the Potential Teachers used reflection as an evaluative tool. They began to scrutinize their strengths and weaknesses and valued reflection as a method of self-evaluation. "In the learning cycle, it is necessary to continually evaluate, and I have enjoyed using reflection as my primary source of self-evaluation"(Susan). "It has allowed me to see my strengths and areas of challenge" (Mary).

Reflection is part of the community of learners that existed in the Summer Academy

The Potential Teachers came to value the small group reflection process and appreciated the ideas generated by their colleagues as well as the opportunity to view issues from a new prospective. "Reflection also encourages me to discuss my teaching with others. This discussion can help generate new teaching ideas" (Barb). An important aspect of the Summer Academy was collaborative planning and reflection. PTs demonstrated awareness and appreciation of the Master Teacher's role of critical friend.

Reflection is an essential piece of the teaching process

"A reflective/analytic teacher is one who makes teaching decisions on the basis of a conscious awareness and careful consideration of the assumptions on which the decisions are based, and the technical, educational and ethical consequences of those decisions" (Yost et al., 2000. p. 41). The Potential Teachers began to see themselves as reflective practitioners. "By thinking back I can evaluate my immediate reaction to the children and the impression that I am giving them". (Emily) "After each lesson I did with the elementary students I would reflect on how I presented the lesson to my students. I would then think about how I could make changes for the middle school students. I would also think of ways to make it more inquiry based by using good questions". (Jill) Finally, concrete realizations about the level of pedagogical knowledge as well as the essence of the teaching profession were at the forefront of the reflections. "I have discovered that I didn't know as much about teaching as I thought I did" (Elizabeth).

Participation in multi-layer reflection gave Potential Teachers the opportunity to see teaching in a new light. They no longer believed that teachers went through the day as automatons, following a prescribed plan that requires no thinking. All to often teachers are seen as operating in a vacuum, the Summer Academy expands the idea of teaching to that of a community endeavor with collegial interaction as the key to professional growth and improved practice.

Although this study does provide insights into preservice teachers' understandings and application of reflection, the duration of the Summer Academy did not allow investigation into how these understandings are implemented once these preservice teachers become practicing teachers. Longitudinal studies should be done to determine how this initial exposure to reflective practice is manifested in professional practice.

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